

Claims

What is claimed is:

1. A closure for a container having an open end and a lip proximate to the open end, the closure comprising:
 - a cap including a cover;
 - at least one locking lever including upper actuation and lower locking arms, the lower locking arm having an inwardly projecting locking wedge; and
 - an elastically deformable hinge connecting the cap to the locking lever, the hinge located between the upper and lower arms for permitting pivoting of the locking lever,
 - the locking lever adapted to releasably engage the container lip by radial displacement of the actuation arms to engage and disengage the locking wedges.
2. The closure according to claim 1 wherein there are at least two locking levers, each locking lever connected to the cap by an elastically deformable hinge.
3. The closure according to claim 2 wherein the cap includes a sealing ring, the sealing ring including a sealing surface; and wherein the locking levers are located radially outward from the ring, the sealing surface of the cap being adapted to seal against a sealing surface of the container lip.
4. The closure according to claim 1 further comprising three locking levers spaced substantially equiangularly about the periphery of the cap.
5. The closure according to claim 1 further comprising two pairs of locking levers, each of the pairs being disposed at substantially diametrically opposite sides of the cap.
6. The closure according to claim 2 wherein the upper actuation arm has a length dimension greater than the length dimension of the lower locking arm.

7. The closure according to claim 2 wherein each of the locking wedges has a guide surface defining a lead angle, the lead angle being within a range of between about eight degrees to about thirty degrees, the guide surface acting in combination with a container lip to facilitate engagement of the locking wedges by radial displacement of the lower locking arm.
8. The closure according to claim 2 wherein each of the locking wedges have a retention surface defining a locking angle, the locking angle being within a range of between about five degrees to about ten degrees, the retention surface acting in combination with a container lip to urge the cap onto the container.
9. The closure according to claim 2 wherein each locking lever has a locking tab with an arcuate shape in one direction which has an inscribed angle less than about 45 degrees.
10. The closure according to claim 2 further comprising an abutment surface located radially inboard of each actuation arm for limiting the pivot motion of the respective locking lever.
11. The closure according to claim 1 wherein the cap includes an integrally formed sealing ring along an underside surface of the cover.
12. The closure according to claim 1 wherein the upper actuation and lower locking arms are substantially vertically aligned.
13. The closure according to claim 1 wherein the cap includes an opening for passing container contents and a hinged cover plate integrally formed in combination with the cover.
14. The closure according to claim 1 wherein the cap includes a cylindrical sidewall having at least one internal thread for engaging with an external thread of a container.

15. The closure according to claim 14 wherein the cap defines a circular groove concentric with the cylindrical sidewall, and further comprising a resilient O-ring seal disposed within and retained by the groove.
16. The closure according to claim 1 wherein the cover, deformable hinge and locking levers are integrally formed from injection molded thermoplastic.
17. The closure according to claim 16 wherein the injection molded thermoplastic is polypropylene.
18. The closure according to claim 2 wherein the deformable hinge is segmented.
19. A closure for a container having an open end and a lip, the closure comprising:
 - a cap including a cover portion and a sealing ring with a sealing surface;
 - at least two locking levers disposed radially outward from the sealing ring, each lever having an upper actuation arm and lower locking arm, the lower locking arm having an inwardly projecting locking wedge; and
 - a deformable hinge connecting the cap to each of the locking levers, each hinge permitting pivoting of the locking levers,
 - the sealing surface of the ring being adapted to contact with a surface of the container, and the locking levers being adapted to releasably engage the container lip through the locking wedges.
20. The closure according to claim 19 wherein there are three locking levers spaced substantially equiangularly about the periphery of the cap.
21. The closure according to claim 19 wherein there are two pairs of locking levers, each of the pairs being disposed at diametrically opposite sides of the cap.
22. The closure according to claim 19 wherein the upper actuation arm has a length dimension greater than the length dimension of the lower locking arm.

23. The closure according to claim 19 wherein each of the locking wedges has a guide surface defining a lead angle, the lead angle being within a range of between about eight degrees to about thirty degrees, the guide surface in combination with the container lip facilitating engagement of the locking wedges by radial displacement of the lower locking arm.

24. The closure according to claim 23 wherein each of the locking wedges have a retention surface defining a locking angle, the locking angle being within a range of between about five degrees to about ten degrees, the guide surface acting in combination with the container lip to urge the cap onto the container.

25. The closure according to claim 19 wherein the sealing ring is formed integral with the cap along an underside surface of the cover.

26. The closure according to claim 19 wherein the cap includes a substantially cylindrical sidewall with an internal thread for engaging an external thread of a container.

27. The closure according to claim 19 wherein the deformable hinge is segmented.

28. A closure/container combination comprising:
a container having an opening and a lip,
a closure removably attachable to the container and including:
a cap having a cover;
at least two locking levers, each lever including an upper actuation arm and lower locking arm, the lower locking arm having an inwardly projecting locking wedge; and
a deformable hinge connecting the cap to each locking lever, each the hinge attaching to the upper and lower arms at an intermediate location and providing a fulcrum about which each of the locking levers can pivot,
the locking levers operative to releasably engage the container lip by radial displacement of the actuation arms to engage and disengage the locking wedges from the lip.

29. The closure/container combination according to claim 28 wherein the cap includes a sealing ring having a sealing surface; wherein the locking levers are disposed radially outward from the ring, the sealing surface of the cap contacting a sealing surface on the container lip when the closure is engaged with the container.
30. The closure/container combination according to claim 28 wherein there are three locking levers spaced substantially equiangularly about the periphery of the cap.
31. The closure/container combination according to claim 28 wherein there are two pairs of locking levers, each of the pairs being disposed at diametrically opposite sides of the cap.
32. The closure/container combination according to claim 28 wherein the upper actuation arm has a length dimension greater than the length dimension of the lower locking arm.
33. The closure/container combination according to claim 28 wherein each of the locking wedges has a guide surface defining a lead angle within a range of between about eight degrees to about thirty degrees, the guide surface acting in combination with the container lip to facilitate engagement of the locking wedges by radial displacement of the lower locking arm.
34. The closure/container combination according to claim 28 wherein each of the locking wedges has a retention surface having a locking angle within a range of between about five degrees to about ten degrees, the retention surface acting in combination with the container lip to urge the cap into contact with the container.
35. The closure/container combination according to claim 28 wherein the container includes an external thread located between the raised lip and the opening and wherein the cap includes a substantially cylindrical sidewall with an internal thread for engaging the external thread of the container.
36. The closure according to claim 28 wherein the cover, deformable hinge and locking levers are integrally formed from injection molded thermoplastic.

37. The closure according to claim 36 wherein the injection molded thermoplastic is polypropylene.

38. The closure according to claim 1 wherein the locking lever includes a textured surface formed on a portion of the upper actuation arm to minimize slippage of a user's fingers during actuation of the lever.

39. The closure according to claim 19 wherein the locking lever includes a textured surface formed on a portion of the upper actuation arm to minimize slippage of a user's fingers during actuation of the lever.

40. The closure according to claim 28 wherein the locking lever includes a textured surface formed on a portion of the upper actuation arm to minimize slippage of a user's fingers during actuation of the lever.